Assembly and operating Instructions

Bypass Flow Meter
DST

Kirchner und Tochter

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1. Foreword

These Installation and Operating Instructions apply to series DST bypass flow meters. Please follow and observe all instructions and information for installation, operation, inspection and maintenance. The Instructions form a component part of the device, and should be kept in an appropriate place accessible to personnel in the vicinity of the location. Where various plant components are operated together, the operating instructions pertaining to the other devices should also be observed.

2. Safety

2.1. Symbol and meaning

Safety notice

This symbol is placed against all directions/information relating to occupational health and safety in these Installation and Operating Instructions, and draws attention to potential danger to life and limb. Such notices must be strictly observed.

2.2. General safety directions and exemption from liability

This document contains basic directions for the installation, operation, inspection and maintenance of the bypass flow meter. Non-observance of these directions can lead to hazardous situations for man and beast and also to damage to property, for which Kirchner und Tochter disclaims all liability.
The operator is required to rule out potentially hazardous situations through voltage and released media energy.

2.3. Intended use

The DST bypass flow meters are designed and intended for measuring the flow of compressible and incompressible fluids. They may only be installed in the pipeline between flanges. Select the DST device model on the basis of the nominal diameter and nominal pressure at the site and also the kind of medium concerned; limit values are specified in the Section "Technical Data" and should not be exceeded.

2.4. Safety information for Operator and operating personnel

Authorized installation, operating, inspection and maintenance personnel should be suitably qualified for the jobs assigned to them, and should receive appropriate training and instruction.

2.5. Special safety information concerning glass devices

For safety reasons, we recommend fitting a protective shield in front of the measuring tube when operating flow meters with glass measuring tubes. The devices should not be operated where there is risk of pressure surges!

2.6. Regulations and guidelines

In addition to the directions given in these Installation and Operating Instructions, observe the regulations, guidelines and standards, such as DIN EN, and, for specific applications, the codes of practice issued by DVGW (gas and water) and VdS (underwriters), or the equivalent national codes, and applicable national accident prevention regulations.

2.7. Information in compliance with the hazardous materials directive

In accordance with German legislation concerning waste disposal (critical waste) and the hazardous materials directive (general duty to protect), we would point out that all flow meters returned to Kirchner und Tochter for repair are required to be free from any and all hazardous substances (alkaline solutions, acids, solvents, etc.).

Make sure that devices are thoroughly flushed out to neutralize hazardous substances.

3. Handling and storage

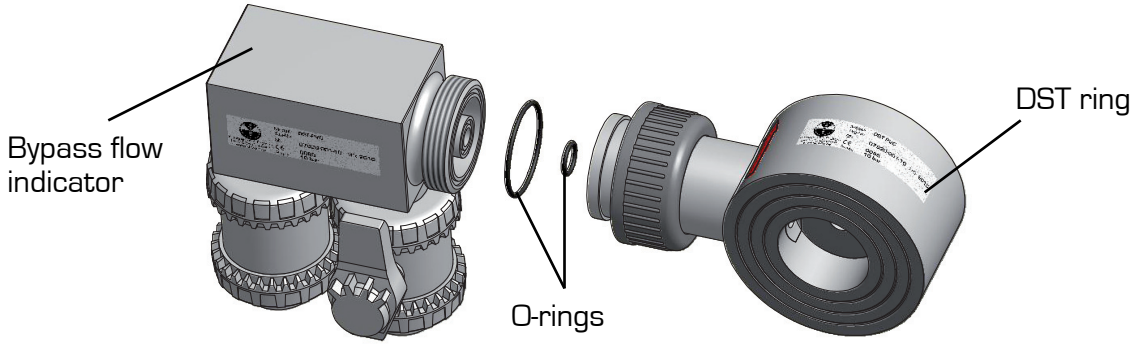
Always use the original packing for transport, handling and storage. Protect the device against rough handling, impact, jolts, etc.!

4. Installation

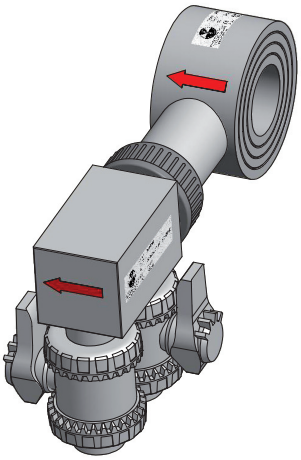
4.1. Pre-assembly

Make sure that the nameplate on the metering orifice has the same number as that on the bypass flow indicator.

1. Place the O-rings in the O-ring groove.
2. As the next step, scrw the bypass flow indicator to the DST ring.



3. Finally, align the DST ring with the bypass flow indicator so that both arrows point in the same direction of flow of the device.



4.2. Preparatory work

Make preparations for inter-flange mounting by having ready the flanges and assembly materials. Provide for a distance between the mounting flanges that is equivalent to the ring thickness plus 2 x the thickness of the gaskets you intend using. The unimpeded straight pipe inlet/outlet runs (A) should be 4 - 6 x DN upstream and downstream of the installation point. The direction of flow through the variable-area flow meter must be from bottom to top. On water service, the indicator is installed in suspended arrangement and on air service in standing arrangement to avoid accumulation of air and condensation of water. To avoid errors, the orifice plate ring is marked with an arrow pointing in the direction of flow (the arrow is punched into metal rings and stuck on to plastic rings).

4.3. Installation of the bypass flow meter DST

- Before installing the device, drain the pipes.
- Observe the maximum pressure and maximum temperature levels.
- The direction of flow must be the same as the direction indicated by the arrow on the orifice plate ring of the device.
- Use gaskets made of rubber or SIL, for plastic devices use only gaskets made of rubber with a Shore hardness A of approx. 65°.
- The gaskets should not project into the pipe and the measuring device must be fitted in line with the pipe axis, as otherwise measurement results would be falsified.
- For orifice plate rings made of PVC, PP and PVDF, tighten screw connections only with a maximum torque of 75 Nm, the device ring could break otherwise.
- Mount the orifice plate ring for the device between the flanges at the point of installation.

De-airing: DST, DST with contacts

- The devices must be completely de-aired: at the maximum possible volume rate of flow in the main pipe, open and then close the ball cock in the bypass behind the outlet of the VA flow meter.
- Slacken the 1½“ union nut on the square head of the bypass line (making sure that both O-rings remain securely in the head) until water flows and the air escapes. If possible, operate the flow meter at full power or more. Should this not prove to be possible, continue the procedure for some time until it is quite certain that all air has been evacuated.

5. Start-up

The device must be properly installed before it is started up.

- Pressurize the measuring line. Avoid pressure surges.
- Check the leak-tightness of the inter-flange connection and, if necessary, tighten down the screw connection.
- With varying volume rates of flow, starting at maximum value, test the local indicator on the device.

6. Readings in operation

The flow value is read off from the scale on the glass cone against the top edge of the float. Readings are only correct when flowing conditions at the measuring point (flowing medium, operating pressure and temperature) correspond to the values marked on the measuring glass. If conditions should differ, the device will need to be recalibrated by Kirchner und Tochter.

7. Limit switches MSK-1 / MSK-12

The flow meter can be equipped with a limit switch to provide the local indicator with a monitoring function. This consists of a limit contact that is operated by a magnet integrated in the float. The switch is guided in a guiding slot on the rear side of the protective casing and can be adjusted over the full measuring range. The switching performance is bistable.
Uncontrolled current and voltage peaks can occur in the case of inductive or capacitive loads, e.g. from contactors or solenoid valves. Such peaks will also occur, depending on cable geometry, where cables exceed a certain length. We therefore recommend using an MSR contact protection relay, which is additionally available. This will increase the contact rating and prevent occurrence of inductive and capacitive peaks, thus ensuring a long contact service life.

7.1. Connection of limit switches

- Electrical connection of the device should be carried out in conformity with the relevant VDE regulations, or equivalent national standards, and in accordance with the regulations issued by the local power supply utility.
- Before connecting the limit switch, ensure that the plant is disconnected from supply.
- Provide a protective circuit for the switches in keeping with their rating.
- Connect appropriate line-side fuse elements based on consumption.
- Connect the cable to the supplied right-angle plug. Assigned are terminals 1 and 2. Earth and terminal 3 are not assigned. The circuit diagram for the limit switches is shown in the Technical Data, Section 10 on page 15.

7.2. Setting the limit switches

- Detach the lock nut M8 located on the neck of the switch.
- Slide the switch to the flow value required to be monitored
- Please make sure the contact never touches the measuring glass and the clearance between contact and glass is always approx. 1mm. This clearance can be obtained by turning the contact in the sliding block.
- Test the switching performance by moving the float beyond the switching position.
- Fasten the lock nut finger-tight. Maximum **fastening torque is 2 Nm.**

8. Linear displacement sensor 4-20mA / 0-10V

Operating principle:

The linear displacement sensor based on the Hall principle delivers an output signal proportional to the height setting of the flow meter.
The can be displayed in 4-20mA or 0-10V.

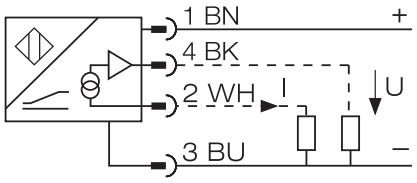
The sensor is connected via the enclosed M12 x 1mm connector.
Please notice that the sensor has a blind zone in the range of 3.7mA to around 4 mA and performs stable operation only after approx. 4mA.

8.1. Connection of the linear displacement sensor

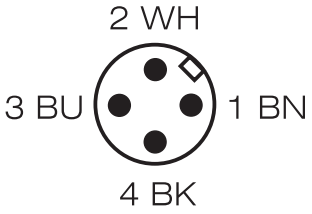
The electrical connection of the device must be performed according to the pertinent VDE regulations, as well as the regulations of the local power company.

1. Disconnect electric power from the system before connecting the sensor.
2. Provide a protective circuit of the sensor corresponding to its output.
3. Connect the protective elements suitable for use upstream.
4. The cable connection is done on the enclosed angle connector. The circuit diagram for the sensor is in the following illustration:

circuit diagram:



pin assignment:



8.2. Setting the linear displacement sensor

Normally the linear displacement sensor is delivered set on the lowest measurement range point. This corresponds in this condition to 4mA.

The other measurement range or mA values can be found in the enclosed protocol.

If you want to set the 4 mA value to another measurement range point, slide the sensor or the 4mA value to the desired point.

To do this, loosen the two outer nuts with their toothed washers. Next loosen the two setscrews by approx. one revolution. Now you can put the sensor in the desired position, and retighten the setscrews and the nuts.

Next move to each following scale mark to determine the mA value belonging to it.

8.3. Technical data

Measurement range [A...B]	160 mm
Repeatability	< 0.1 % from measurement range lA-Bl
	< dependent upon position sensor
Linearity deviation	<1 % v. E.
Temperature drift	<±0.006%/K
Ambient temperature	-25...+ 70 °C
Operating voltage	15 – 30 VDC
Residual ripple	< 10 % U_{ss}
Idle current I_0	< 15 mA
Rated insulation voltage	< 0.5 kV
Short circuit protection	yes
Fail-safe circuit / reverse polarity protection	yes/ complete
Output function	four-wire, analogue output
Voltage output	0... 10V
Current output	4 – 20 mA
Load resistor voltage output	>4.7 kΩ
Load resistor current output	<0.4 kΩ
Recovery time at output	< 15 ms
Sampling rate	200 Hz
Type	Quader, Q25L
Dimensions	201 x 35 x 25 mm
Housing material	Aluminium
Material of active surface	Plastic, PC-GF20
Connection	Plug connector, M12x1
Vibration resistance	55 Hz(1 mm)
Shock resistance	30g (11 ms)
Protection class	IP67
Operating voltage display	LED green
Measurement range display	LED, yellow, position sensor in detection range

9. Maintenance of the flow meter

The device is maintenance-free.

10. Service

All devices with defects or deficiencies should be sent direct to our repair department. To enable our customer service facility to deal with complaints and repairs as quickly as possible, you are kindly requested to coordinate the return of devices with our sales department, Tel. +49 (0) 2065-96090.

Disposal

Please help to protect our environment, and dispose of workpieces in conformity with current regulations or use them for some other purpose.

11. Technical data

Versions

Version	DST-PVC	DST-PP	DST-PVDF	DST 1/2	DST-V4A
Ring	PVC	PP	PVDF	Steel, grade	1.4571 steel
Orifice plate	PVC	PP	PVDF	1.4301 steel	1.4571 steel
Valves	PVC	PP	Polysulphone / PVDF can be supplied without valves	Brass, nickeplated	1.4571 steel
Bypass	PVC	PP	PVDF	Steel, galvanized	1.4571 steel
Indicator [1]	RA 77 / PSU	RA 77 / PSU	PSU / RA 87	RA 65	RA 87
Meas. glass	Borosilicate glass / opt. Polysulphone	Borosilicate glass / opt. polysulphone	Borosilicate glass / optionally	Borosilicate glass	Borosilicate glass
Float	PVC, optionally	PP, optionally	PVDF, optionally	Water: 1.4305	Water: 1.4571 steel
	1.4571 steel, PTFE	1.4571 steel, PTFE	1.4571 steel, PTFE	Air: Al anodized	Air: Teflon
Gaskets	EPDM, opt. Viton	EPDM, opt. Viton	Viton, optionally	NBR	Viton
Max. temp. / pressure	20°C at 10 bar 40°C at 6 bar	20°C at 10 bar 70°C at 2,5 bar 80°C at 1.5 bar	20°C at 10 bar 80°C at 5 bar 100°C at 4 bar	20°C at 10 bar Special version: 80°C at 5 bar	20°C at 10 bar Special version: 80°C at 5 bar

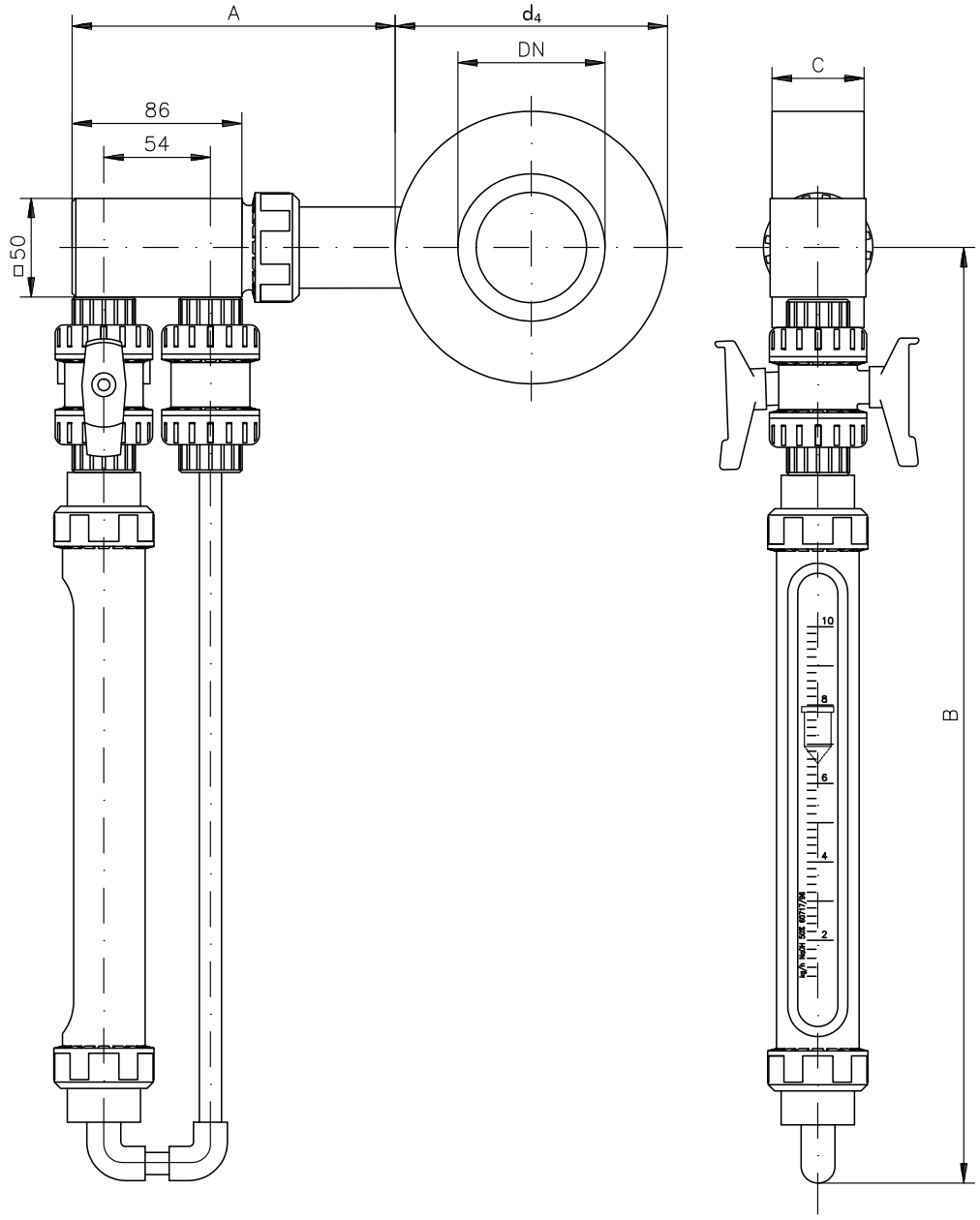
Measuring ranges (DST, DST-MSK-1, DST-MSK-12)

DN	Measuring range [1] H_2O m^3/h	Max. pressure drop in hPa	Measuring range [2] air m^3/h at STP	Max. pressure drop in hPa
32	0.02 - 0.16 3.5 - 25	150 300	0.15 - 1.5 35 - 200	68 38
40	0.02 - 0.16 4 - 30	150 350	0.15 - 1.5 35 - 200	68 38
50	0.02 - 0.16 4.5 - 40	150 550	0.15 - 1.5 49 - 300	68 38
65	1.2 - 2.7 7 - 60	36 550	12.5 - 30 78 - 535	6 55
80	1.2 - 3.3 13 - 100	51 350	14 - 30 150 - 1010	6 50
100	3 - 7 25 - 200	58 430	30 - 70 280 - 1750	6 60
125	8 - 15 40 - 300	30 350	95 - 200 470 - 2850	6 60
150	14 - 30 55 - 380	42 500	185 - 400 640 - 3850	7 53
200	30 - 75 90 - 650	42 500	380 - 790 1125 - 6000	6 69
250	43 - 140 150 - 680	90 270	390 - 800 1200 - 6000	7 70
300	75 - 250 170 - 665	84 360	390 - 800 1200 - 6000	7 70
400	130 - 500 300 - 1800	140 280	-	-

[1] Refer to relevant Data Sheet

[2] In each case the minimum and the maximum measuring range are specified. Please ask for our detailed "DST-DN and measuring ranges" Table. Measuring ranges for other process media and operating conditions available on request

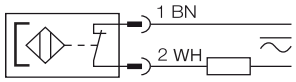
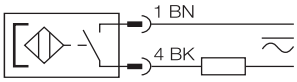
Dimensions

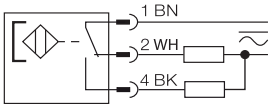


DN	32	40	50	65	80	100	125	150	200	250	300	400
d_4	78	88	102	122	138	158	188	212	268	320	370	482
A	160	160	160	160	160	160	160	160	160	160	160	160
B	DST-PVC 500 mm, DST-PP 528 mm, DST-PVDF 555 mm, DST-1/2 543 mm											
C[3]	50	50	50	50	50	50	50	50	50	50	50	50

[3] optionally: special overall lengths possible

Technical data of limit switches

Design	MSK1	MSK12
Voltage switched	50VAC/75VDC	50VAC/75VDC
Current switched	0,5A	0,5A
Contact rating	10W/VA	10W/VA
Dielectric strength	230VAC/400VDC	230VAC/400VDC
Temperature range	-20 to +90°C	-20 to +90°C
Switching function	normally closed contact	normally open contact
Connection		

Design	MSKW
Voltage switched	50VAC/75VDC
Current switched	0,5A
Contact rating	5W/VA
Dielectric strength	110VAC/200VDC
Temperature range	-20 to +90°C
Switching function	change over contact
Connection	

[1] The deciding factor is the thermal endurance of the flow meter!
Connection via right angle plug M12x1

The equipment from **Kirchner und Tochter** has been tested in compliance with applicable CE-regulations of the European Community.

The respective declaration of conformity is available on request.

Technical data supplied without liability. The current valid version of our documents can be found under this URL: www.kt-flow.de

The **Kirchner und Tochter** QM-System is certified in accordance with DIN-EN-ISO 9001:2008. The quality is systematically adapted to the continuously increasing demands.

Kirchner und Tochter

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